constant 10-degree diameter circle, the effectiveness of sighting the objective decreases with an increase in this angular displacement. Said another way, your ability to see detail will be excellent at a point near the aircraft, but will decrease as the angular displacement increases. At the scanning range, at which the angular displacement may be as much as 45 degrees, the resolution of detail area probably will have shrunk to a 4-degree diameter circle.

This is why having scanners looking out both sides of the aircraft is optimal. With track spacing (explained later) proper for the given search visibility, each scanner will look at roughly the same area (i.e., double coverage).

5.3.2 Field of scan

The area that you will search with your eyes in lines of scan is called the field of scan. The upper limit of this field is the line that forms the scanning range. The lower limit is the lower edge of the aircraft window, while the aft (back) limit is usually established by the vertical edge of the aircraft window. The forward (front) limit for a field of scan will vary. It might be established by a part of the airplane (such as a wing strut). Or, when two scanners are working from the same side of the airplane it might be limited by an agreed-upon point dividing the field of scan.

5.3.3 Scanning Range

We are using the term “scanning range” to describe the distance from a moving aircraft to an imaginary line parallel to the aircraft’s ground track (track over the ground.) This line is the maximum range at which a scanner is considered to have a good chance at sighting the search objective.

Scanning range sometimes may be confused with search visibility, which is that distance at which an object on the ground (CAP usually uses an automobile as a familiar example) can be seen and recognized from a particular height. Aircraft debris may not be as large as an automobile and may not be immediately recognizable as aircraft debris, particularly when the aircraft is flying at 100 mph. Therefore, scanning range may be less than but never greater than the search visibility (in CAP searches, we rarely credit a search visibility of greater than three or four nautical miles).

From an altitude of 500' AGL and a scanning angle of 45**º**, the ratio of altitude to scanning range is one-to-one, so scanning range is only 500 feet; at 1000' AGL and 45**º**, scanning range is 1000 feet. To achieve scanning ranges applicable for typical search altitudes, the scanning angle (angular displacement *below the horizon*) typically would be 10**º** (farther limit) and 20**º** (closer limit) for scanning range at each altitude.

The following chart depicts the scanning ranges associated with various combinations of scanning altitudes and angles. From this, scanning ranges of one-half mile or greater would require a compromise in either higher altitudes or low depression angles. For lower scanning angles, the fixation area within the scanning cone would be extremely elongated (and much smaller), whereas for higher altitudes the size of objects on the ground would be smaller and thus harder to detect.

Altitude (AGL)	Scanning Range (feet)	Scanning Range (miles)	Scanning Angle (º)
500'	866	0.164	30
	1374	0.260	20
	2836	0.537	10
1000'	1732	0.328	30
	2747	0.520	20
	5671	1.074	10
1500'	2598	0.492	30
	4121	0.781	20
	8507	1.611	10

** Angular displacement measured from the horizon

Concerning scanning technique, with this chart representing the relationship of altitude and angle, use of depression angle would seen to provide the most practical approach for estimating scanning range. Thus, for a deflection angle of 70º, the depression angle is 20º (e.g., about two “fists” below the natural horizon). To provide a reference mark of the scanning range for the scanner in the rear seat, a piece of masking tape could be placed on the front of the window frame equivalent to the depression angle used to estimate the scanning range. A similar reference mark could be placed on the bottom of the window for the scanner in the front sear.

If your pilot states that the search altitude will be 1,000' AGL, you can expect a scanning range of between ½ and 1 mile. If you drop down to 500' AGL to investigate a potential sighting, you can expect your scanning range to be ¼ to ½ mile. There are many variables that affect both the effective scanning range and your probability of detecting the search objective; these are discussed later.

5.4 Scanning patterns

To cover the field of scan adequately requires that a set pattern of scan lines be used. Research into scanning techniques has shown that there are two basic patterns that provide the best coverage. These are called the *diagonal pattern* and the *vertical pattern.*

Figure 5-5 illustrates the way the diagonal pattern is used when sitting in the right rear seat of a small airplane. This line is followed from left to right as in reading. The first fixation point is slightly forward of the aircraft's position. Subsequent fixation points generally follow the line as indicated in the figure.